

Chapter Three: Progress in Protecting National Park System Natural Resources

The Challenge funding often provided the critical mass of capability to enable a park to attract more volunteers, partnerships, and other assistance to enhance the natural resources program.

This chapter focuses on programs whose accomplishments primarily relate to the National Park Service Strategic Plan goal (Ia) that:

Natural . . . resources and associated values are protected, restored, and maintained in good condition and managed within their broader . . . context.

Described are accomplishments of the natural resource programs that received Natural Resource Challenge funding in Fiscal Year 2003:

- Parks Receiving Natural Resource Challenge Base Increases
- Air Resources Program
- Biologic Resources Management Program
- Geologic Resources Program
- Natural Resource Preservation Program (NRPP)
- Resource Damage Assessment and Recovery Program
- Resource Protection Program
- Water Resources Program

Detailed financial information about these programs is located in Chapter Five.

PARKS RECEIVING NATURAL RESOURCE CHALLENGE BASE INCREASES

Challenge Activity:

- *Park invasive species control/threatened and endangered species recovery*

Cumulative Challenge Increases:

- *\$6,595,000 (in FY 2001 and FY 2002)*

Thirty-six national parks have received Natural Resource Challenge-funded base increases for natural resource management. Because the funds are transferred to parks and become indistinguishable from other base funds, no specific FY 2003 allocation is shown. However, Chapter Five contains information about the funding provided to

individual parks, as well as each park's FY 2002 and FY 2003 funding level for its natural resource program.

While no new national parks were funded in FY 2003, the Natural Resource Challenge base funding had a significant impact on the ability of the natural resource management program at each Challenge-funded unit to manage and protect natural resources. In most cases, the Natural Resource Challenge increases greatly strengthened the ability of an individual park to address its most critical problems in managing exotics and improving habitat for threatened and endangered species. The Challenge funding often provided the critical mass of capability to enable a park to attract more volunteers, partnerships, and other assistance to enhance the natural resources program. The effect was great because the Natural Resource Challenge funding contributed a total of 40 percent of the base funding for natural resources in the selected parks.

An evaluation of the accomplishments made by the individual parks toward the management of exotic plants, animal invaders, threatened and endangered species, and other native species proves that the Natural Resource Challenge funding was critical for maintaining and improving management efforts. Before receiving Challenge funding, most parks lacked sufficient human resources to plan, direct, and accomplish reductions in exotic invaders; improve habitats for threatened and endangered species; plan and track changes on Geographic Information System equipment; and cooperate with local entities on common concerns related to individual parks. This funding directly contributed to the National Park Service exceeding its goals for containing exotic vegetation and for achieving stable or improved populations of threatened and endangered species.

Following are some specific accomplishments of individual parks:

- **Dinosaur National Monument** was able to seek and supervise nearly 3,000 person-hours of help in exotic species management. By hiring two seasonal park rangers to provide education and project supervision, 524 volunteer “Weed Warriors” contributed 2,929 person-hours in FY 2003, removing invasive tamarisk and perennial pepperweed from riparian habitat along the Green and Yampa Rivers. The Weed Warrior Program has reached 400 to 800 people each year and involved difficult work in remote back-country settings where access is available only to whitewater boats. The Challenge increase represented the first opportunity to make this popular education and service-oriented program a permanent part of the outreach and partnership development repertoire of the park.
- **Pictured Rocks National Lakeshore** mechanically removed more than 150,000 spotted knapweed plants from the Grand Sable Dunes Natural Research Area, the only perched dune system on Lake Superior, to protect the federally-threatened pitcher’s thistle and to aid in restoration of the vegetation community of the dune system. Spotted knapweed is an invasive exotic plant that competes with and ultimately replaces native dune vegetation, including pitcher’s thistle.
- **Zion National Park**, in cooperation with the U.S. Geological Survey Biological Resources Division, completed an intensive line-distance sampling study for the threatened desert tortoise. The survey found an average of 14 tortoises in park habitat, with a 95 percent confidence interval between 12 and 26. Juvenile tortoises were documented for the first time, indicating that the park has a breeding population.
- **Great Smoky Mountains National Park** initiated action on hemlock woolly adelgid (HWA), which has become much more obvious since its discovery in 2002. Nearly 70 known sites have been recorded in a GIS database. Treatments for this potentially devastating nonnative forest pest include insecticidal soap spray (where accessible), soil injection of the

systemic insecticide Imidacloprid, and release of a nonnative predator beetle (*Pseudoscymnus tsugae*). Seven additional *P. tsugae* releases were made in 2003 for a total of 15 sites to date. Forty-eight sites were treated with soap, using more than 16,000 liters of spray. American holly and Rhododendron dieback were monitored in 2003.

- **Gates of the Arctic National Park and Preserve** personnel continued monitoring musk ox populations, trends, and movement patterns in conjunction with the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game (ADF&G). Musk ox is a subsistence species. ADF&G issued two emergency orders for take of musk ox that required National Park Service involvement. In addition, a Kobuk River moose survey was completed during spring 2003. Further analysis of data is required. Low numbers (total moose less than 0.2 moose per square mile) conflict with subsistence and sport hunters. Insufficient data on moose numbers have required this survey and may necessitate further survey work.

Because Natural Resource Challenge funding for these national parks has become part of their total operating budgets, parks are requested to report on their total natural resource programs, since it is not possible in most cases to distinguish Challenge funds from other base funds. Based on information provided by parks, it appears that many parks—nearly a third—experience a difficult time retaining funding for their natural resource programs because of incremental changes. Across-the-board reductions in appropriations, travel cuts, and salary increases that are not offset by appropriations can reduce total park funding or affect its distribution. For example, funds from other park programs might need to be allocated to cover increased salary costs for law enforcement personnel. While some park natural resource programs were affected by these budget changes, other parks, through a combination of differing circumstances and priorities, were able to maintain more fully the gains brought about by the Natural Resource Challenge. In all cases, however, it is clear that the Challenge has produced positive change, clearly demonstrated by the accomplishments reported.

AIR QUALITY PROGRAM

Challenge Activities:

- *Air emissions inventory*
- *Expand air quality monitoring and related activities*
- *FY 2003 Allocation: \$9,888,000*

This Natural Resource Challenge-funded expansion reflects the tie between the Challenge funding and the National Park Service strategic plan. The National Park Service goal for FY 2003 was that 61 percent of reporting parks would have stable or improved air quality. The National Park Service can influence, but not directly control, achievement of this goal, which is dependent upon climatic factors and the actions of permit holders and regulators. In FY 2003 only 54 percent of reporting parks had stable or improved air quality; expanded monitoring and ability to provide information to state regulators and those requesting emissions-related permits can help improve air quality in these parks.

Air Emissions Inventory

The Air Resources Division continued its effort to address in-park air pollution sources. The National Park Service initiated audits of air pollution sources in more than

55 parks. Nine of these were completed in FY 2003. These audits are used to calculate emissions, identify strategies to reduce or prevent pollution from park operations, and determine compliance with state and federal air pollution regulations.

Park operations are found to be substantially in compliance with air pollution control, permitting, and emission fee requirements. In addition, many parks are currently implementing green strategies that reduce air pollution emissions, such as alternative transportation measures, use of alternative fuels and vehicles, and fire management practices aimed at preventing the accumulation of woody fuels.

Natural Resource Challenge funds made it possible for the Air Resources Division to provide more specialized and intensive service to parks engaged in environmental planning for activities that result in air pollution, such as use of recreational vehicles and prescribed burning.

Air Quality Monitoring, Analysis, and Technical Assistance

The NPS network, now with some type of air quality monitoring in 63 parks, consists

National Park Service Air Quality Monitoring Sites



**National Park Service Air Quality Monitoring Sites
Funded by Natural Resource Challenge (NRC) or Funded by Other Sources**

PARK CODE	PARK	NON-NRC FUNDING	NRC FUNDING
ACAD	Acadia National Park	1	
ASIS	Assateague Island National Seashore	1	
BADL	Badlands National Park		1
BAND	Bandelier National Monument	1	
BIBE	Big Bend National Park	1	
BISO	Big South Fork National Recreation Area		1
BLCA	Black Canyon of the Gunnison National Park		1
BRCA	Bryce Canyon National Park	1	
BUFF	Buffalo National River	1	
CACO	Cape Cod National Seashore	1	
CANY	Canyonlands National Park	1	
CARE	Capitol Reef National Park	1	
CATO	Catoctin Mountain Park		1
CAVO	Capulin Volcano National Monument	1	
CHAM	Chamizal National Memorial	1	
CHIR	Chiricahua National Monument	1	
CHIS	Channel Islands National Park	1	
COSW	Congaree Swamp National Monument	1	
COWP	Cowpens National Battlefield	1	
CRLA	Crater Lake National Park	1	
CRMO	Craters of the Moon National Monument	1	
DENA	Denali National Park		1
DEVA	Death Valley National Park	1	
EVER	Everglades National Park	1	
GLAC	Glacier National Park		1
GRBA	Great Basin National Park	1	
GRCA	Grand Canyon National Park		1
GRSA	Great Sand Dunes National Preserve	1	
GRSM	Great Smoky Mountains National Park		1
GUMO	Guadalupe Mountains National Park	1	
HALE	Haleakala National Park	1	
HAVO	Hawaii Volcanoes National Park	1	
INDU	Indiana Dunes National Lakeshore	1	
ISRO	Isle Royale National Park		1
JOTR	Joshua Tree National Park	1	
KOVA	Western Arctic-Alaska		1
LABE	Lava Beds National Monument	1	
LAME	Lake Mead National Recreation Area		1
LAVO	Lassen Volcanic National Park	1	
MACA	Mammoth Cave National Park		1
MEVE	Mesa Verde National Park		1
MORA	Mount Rainier National Park	1	
NACA	National Capital		1
NOCA	North Cascades National Park	1	
OLYM	Olympic National Park	1	
ORPI	Organ Pipe Cactus National Monument	1	
PAIS	Padre Island National Seashore	1	
PEFO	Petrified Forest National Park		1
PINN	Pinnacles National Monument	1	
PORE	Point Reyes National Seashore	1	
REDW	Redwood National Park	1	
ROMO	Rocky Mountain National Park	1	
SAGU	Saguaro National Park	1	
SEKI	Sequoia and Kings Canyon National Parks		1
SHEN	Shenandoah National Park		1
THRO	Theodore Roosevelt National Park	1	
TONT	Tonto National Monument	1	
VIIS	Virgin Islands National Park	1	
VOYA	Voyageurs National Park	1	
WICA	Wind Cave National Park		1
YELL	Yellowstone National Park		1
YOSE	Yosemite National Park		1
ZION	Zion National Park		1
TOTAL		42	21

of ozone monitors, fine particle samplers, acid deposition monitors, optical monitors, and, in partnership with the Environmental Protection Agency (EPA), a network of ultraviolet-B monitors.

The National Park Service air quality monitoring network is being expanded as a result of the Natural Resource Challenge to provide improved geographical representation, with emphasis on parks most threatened by air pollution or most vulnerable to degradation caused by air pollution. The network expansion is guided by information developed for air resource inventories and conducted under the Inventory and Monitoring Program. In FY 2003 the NPS continued with the phased deployment of air quality monitoring sites begun in FY 2002. Consequently, 21 of the 63 parks with air quality monitoring as of FY 2003 received new or expanded monitoring because of Natural Resource Challenge funding. Additionally in FY 2003, the National Park Service completed the staffing of Challenge air resources field specialists, continued four ecological effects projects initiated in FY 2002, and initiated two new projects. Complementary activities related to data management, reporting, and interpretation are also being augmented, as are funds provided to parks to support monitoring efforts.

BIOLOGICAL RESOURCES MANAGEMENT PROGRAM

Challenge Activity:

- *Create native/nonnative species management program/field teams for nonnative species management*
- *FY 2003 Allocation: \$7,930,000*

To assist parks in addressing current natural resource management issues, the Biological Resources Management Division (BRMD) provided professional, science-based support for invasive species management, terrestrial ecosystem restoration, threatened and endangered species protection, integrated pest management, and wildlife management. This Natural Resource Challenge-funded program contributed directly to the National Park Service exceeding its FY 2003 goal that 22.3 percent of park populations of threatened and endangered species remain stable and 14.5 percent improve. Parks reported that 23.3 percent of their threatened or endangered species

were stable, and 29.9 percent were improving. This program also directly contributed to the National Park Service exceeding its FY 2003 goal to contain exotic vegetation on a cumulative 122,600 acres; exotic vegetation was contained on a total of 267,480 acres.

Exotic Plant Management Teams (EPMTs)

National parks are home to complex native communities of plants and animals that are threatened by the invasion of exotic plants and animals, as well as by human-caused disturbances that foster the establishment of exotic species. Exotic plants infest approximately 2.6 million acres in the national parks, making control of exotic species one of the most significant land management issues facing national parks. To address invasive nonnative plant issues, Exotic Plant Management Teams have been established to focus on invasive species management. These teams were funded specifically to help address an important National Park Service Strategic Plan goal and significantly helped the National Park Service to exceed its FY 2003 goal to contain exotic vegetation. The fact that the NPS exceeded its goal of containing exotic vegetation by more than 100,000 acres can be attributed in part to the deployment of seven additional Exotic Plant Management Teams, as well as the continued priority focus of parks on harmful invasive species.

Exotic Plant Management Teams (EPMTs), modeled after the coordinated rapid-response approach used in wildland fire fighting, assist parks in combating and controlling exotic plants by providing a highly trained mobile strike force of plant management specialists. In FY 2003 seven new EPMTs were established, adding to the nine teams established over the previous three years.

Summary EPMT Accomplishments

Inventoried acres	627,112
Treated acres	10,666
Monitored acres	340
Re-treated acres	1,039
Restored acres	191
Hours lost due to injury	16
Total Person-hours	88,829

- In FY 2003 these 16 EPMTs, which serve more than 219 parks, inventoried more than 627,000 acres of land and found gross infestation of weeds on 520,516 acres.
- Since initial inception of teams in 2000, at least 12 exotic plant species that were previously identified have been controlled to a maintenance level in park units.
- In FY 2003 National Park Service EPMTs leveraged more than \$2.8 million through partnerships to enhance invasive plant control. For example, collaboration with the Student Conservation Association has led to the formation of student corps to assist EPMTs in controlling invasive plants. Partnership goals are to build Native Plant Corps that will increase park capacity to control invasive plants, restore native plants, and to provide invasive plant management training to young professionals.

Two teams at opposite ends of the country provide examples of how these teams operate, take advantage of partnership opportunities, and successfully address exotic vegetation.

Many invasive exotics take advantage of the no-freeze zone and limited environmental constraints in Florida and the Caribbean. Species such as melaleuca and Brazilian pepper shut out all native species and outcompete them entirely. Areas of coastal mangrove habitat, cypress domes, and marl prairies are threatened by these exotics. Unique island species are threatened in the Caribbean. The Florida/Caribbean Partnership EPMT (FLC-EPMT) addresses these issues. This EPMT was established in partnership with the Florida Department of Environmental Protection (DEP) Upland Invasive Plant Management Program, which was established in 1997, and partners with 400 public land managers who work to control exotic plants. The National Park Service selects and submits projects to DEP under this partnership. The control costs for the projects are divided, and control is accomplished using private contractors. In FY 2003 the Florida EPMT expanded to include the U.S. Virgin Islands. This expansion was the result of a cooperative agreement with the University of Florida under a

grant from the U.S. Department of Agriculture Subtropical Agricultural Research Program Grant.

- In FY 2003 the FLC-EPMT entered a cooperative agreement with the South Florida Water Management District for mapping exotic plants on eight million acres of natural areas in south Florida. FLC-EPMT received \$542,704 in Cooperative Conservation Initiative funding; \$423,000 from Florida DEP; and \$411,112 from EPMT funding.
- Overall, the FLC-EPMT has increased productivity and expanded geographically. However, the invasive species list continues to grow. Fighting invasives in this region requires constant monitoring and continued treatment. A rapidly spreading species, the old world climbing fern, poses a serious threat to tree islands in parts of **Everglades National Park** and surrounding areas.

The California Exotic Plant Management Team experienced a successful FY 2003 season serving 12 partner parks and one additional park. During this second year of operation, the EPMT focused on refining and expanding its ability to serve park needs. Carefully allocating personnel and equipment costs, as well partnering with the Student Conservation Association, the team was able to increase in size by the equivalent of 2.5 team members. Because of its efforts, the NPS now has a presence on the California Invasive Plant Council board of directors and the California Interagency Noxious Weed Coordinating Council. The team philosophy has been to concentrate on smaller, outlying infestations—selecting projects that tend to protect relatively rare or pristine areas. To accomplish this, they developed a project request protocol that facilitates strategic prioritization and enhanced partner park commitments.

- One of the more rewarding projects this year was treatment of a pampas grass invasion on the 600-foot rocky cliffs overhanging the Pacific Ocean at **Point Reyes National Seashore**. Exotic Plant Management Team members were lowered on rappel lines onto Wildcat Cliffs to remove this last untreated pampas grass site within Point Reyes National Seashore. The heat from the



cliffs and the instability of the crumbling sandstone presented challenges; yet, the team managed to manually remove a total of 1,391 plants from these nearly vertical slopes. The work culminated a four-year effort by the park to remove pampas grass from the ecosystem and has made the team a model on how to join forces with a park to remove an “A-rated” invasive on a coastal-scrub site that is extremely difficult to access.

Ecological Restoration

In this component of its program, the Biological Resources Management Division continued to provide assistance in the development of the Fire Ecology Program Strategic Plan and worked with the NPS Fire Management Program to develop a white paper on NPS Fuels Management Strategies in response to the President’s Healthy Forest Initiative. Technical assistance continued on the “Natural Resource Damage Assessment” for Morristown National Historic Park and on contaminated sites for Appalachian National Scenic Trail and Cape Krusenstern National Monument. The Division was also part of an interdisciplinary team to assess numerous disturbed sites at Golden Gate National Recreation Area. In addition, initial assessments of degraded sites were made at Colorado National Monument and Mesa Verde National Park, and a second assessment was made of restoration issues

associated with work done by Exotic Plant Management Teams. Project issues generally addressed included native plant establishment, restoration monitoring, environmental and ecological planning in the face of degrading systems due to invasive species, and soil quality. The BRMD sponsored and developed the March 2003 Arid Land Restoration Workshop that provided a forum to collect and assess restoration needs from the NPS and southwest arid land parks restoration and revegetation specialists. The Division also worked with the Great Plains Cooperative Education Studies Unit (CESU) to organize a symposium on restoration research in prairie parks for the November 2003 Society for Ecological Restoration Meeting.

Integrated Pest Management (IPM) Program

The IPM Program provided training and responded to more than 100 technical assistance requests submitted by parks and regions through consultations, distributed material, remote consultations on problems, and identification of other experts. The Integrated Pest Management Program coordinated and provided instruction for a 36-hour course at the National Conservation Training Center in West Virginia, which was the first joint course on IPM principals by both the National Park Service and the U.S. Fish and Wildlife Service. To enhance technical assistance response,

an IPM expert contracted from Pennsylvania State University has contributed much through the Concessions Environmental Audit Program to install IPM practices into concessions operations and also to conduct a review of the IPM training program to ensure it was professional and current.

Integrated Pest Management Program staff continued to coordinate actions, guidance, and policy response on the West Nile Virus (WNV). Staff members served as lead for the WNV Zoonotic Environmental Disease (ZED) Task Force, coordinated preparation of guidance/policy for parks with other members of WNV ZED task force, and contributed to congressional briefings on WNV. Staff also participated in Centers for Disease Control WNV state agency weekly conference calls, keeping the program updated on virus activity and management efforts to promote cooperation between states and parks in managing WNV. Integrated Pest Management Program staff also participated in a number of federal working groups, including the Invasive Terrestrial Animals and Pathogens (ITAP) Group that provides a forum for coordinating support among member agencies on problems associated with invasive terrestrial animals and pathogens. The National Park Service also

cooperates in the U.S. Forest Service (USFS) Forest Health Management System. The nationwide drought of recent years has placed stress on forests, and in some cases, increased insect survival. These two trends combine to threaten the health of trees. A major development has been the surge of hemlock woolly adelgids into the southern Appalachians. Park managers responded by submitting 50 percent more proposals for USFS forest health funding in FY 2003 than in FY 2002. The Biological Resources Management Division coordinates park requests; the U.S. Forest Service funded all 17 NPS requests, providing a total budget of \$537,700.

Endangered Species Program

The National Park Service presently protects 349 species that are threatened, endangered, proposed, experimental, managed via conservation agreement, or candidates for listing. These organisms are represented in 889 populations in 169 NPS units. Another 246 populations have historically existed in parks, and in many cases could be restored. While mammals and birds represent only 25 percent of the listed species in parks, they draw a disproportionate amount of the funding, as do threatened or endangered species popula-

Number of Endangered, Threatened, Proposed, and Candidate Species Found in National Park Units (as of September 30, 2003)

CATEGORY	NUMBER
Endangered Species	200
Threatened Species	84
Experimental Species	3
Proposed Species	4
Candidate Species	51
Managed via Conservation Agreement	7
TOTAL	<u>349</u>

Number of Endangered, Threatened, Proposed, and Candidate Species Found in National Park Units by Taxonomic Group (as of September 30, 2003)

GROUP	SPECIES
Plants	152
Invertebrates	47
Fish	37
Amphibians	6
Reptiles	18
Birds	50
Mammals	39
TOTAL	<u>349</u>

tions that parks have reported as stable, increasing, or not-at-risk. A new database developed by the Biological Resources Management Division is providing direction to change this trend by furnishing information that suggests species for new recovery projects.

The Endangered Species Program continues to assist in restoring and stabilizing federally listed species, as well as those that are proposed for listing and those that are candidate species. The FY 2003 program has focused on helping to make endangered species consultation for park actions a routine practice and on providing the opportunity for park staff to learn the modern skills of endangered species management.

Through the Endangered Species Program, BRMD reviews the implementation plans and annual accomplishment reports for projects funded through the NRPP Threatened and Endangered source and the new Resource Protection project funding. Projects developed in the past year include restoration of condors at Pinnacles National Monument and silversword at Hawaii Volcanoes National Park; developing biome-based resource protection from Shenandoah National Park to Great Smoky Mountains National Park; and introducing a new resource protection curriculum for personnel across the NPS.

The Endangered Species Program continued to play a role in negotiating MOUs with other federal agencies, as well as in drafting internal NPS guidance.

Wildlife Program

In FY 2003 the Biological Resources Management Division assisted several parks in evaluating and developing wildlife management actions for critical wildlife issues. This included assisting Channel Islands National Park in developing and implementing aerial capture operations for the removal of golden eagles; Big Bend National Park in developing management alternatives for the removal of feral hogs and trespass livestock; and Fossil Butte National Monument in developing management strategies for coyotes and possible transient wolves. The BRMD conducted six training classes in Aerial Capture, Eradication, and Tagging of Animals (ACETA).

The Biological Resources Management Division's Wildlife Health Program provided policy guidance, technical assistance, and training to enhance the ability of park staff to meet the increasing demands of wildlife health issues including field anesthesia, sample collection and diagnostics, disease management, fertility control, and the identification of wildlife health research needs. Veterinary diagnostic services were provided to NPS units in partnership with the U.S. Geological Survey (USGS), National Wildlife Health Center (NWHC), and the Colorado State University Veterinary Diagnostic Laboratory (CSUVDL). More than 120 diagnostic submissions were processed by CSUVDL. Chronic wasting disease (CWD) continued as a priority wildlife health issue this fiscal year. A chronic wasting disease coordinator was hired, and technical assistance provided to parks, particularly Rocky Mountain and Wind Cave National Parks. Training and consultation were also provided to staff from 10 other NPS units, and scientific information on wildlife disease was presented in several publications and forums with large NPS audiences. The BRMD continued interagency interactions via the CWD Implementation Team, state wildlife agencies, USGS, Food and Drug Administration, and Environmental Protection Agency. The BRMD collaborated with the Colorado Division of Wildlife on fertility control work in captive cervids and in elk at Rocky Mountain National Park. The Biological Resources Management Division also continued assistance with safety evaluation of brucellosis vaccine RB51 in pronghorn and continued collaboration with CSU scientists on CWD studies.

The Park Flight Migratory Bird Program (Park Flight) works to protect shared migratory bird species and their habitats in both U.S. and Latin American national parks and protected areas. In FY 2003 Park Flight, in cooperation with the National Park Foundation, supported seven bird conservation and education projects in 13 U.S. national parks and in protected areas in Guatemala, El Salvador, Nicaragua, Honduras, Panama, and Mexico. The program was also expanded to include a new project in Alaska and in South America (Argentina). As part of the FY 2003 Park Flight technical exchange effort, four international interns from Mexico and Panama assisted with monitoring and educational efforts at

North Cascades National Park, Point Reyes National Seashore, Golden Gate National Recreation Area, and Cuyahoga Valley National Park. These technical exchanges were coordinated through the NPS Office of International Affairs International Volunteers in Parks Program. The Park Flight Program held its second grantee workshop in FY 2003 in Pico Bonito National Park in Honduras. The goal of the workshop was to help integrate monitoring and education efforts and to improve knowledge and coordination of migratory bird monitoring programs in U.S. national parks and counterpart protected areas of the Mesoamerican region.

Biological Resource Projects

National Level Support Biological Resources Management Division competitive funds benefit multiple partners and are used for biological resource projects that address issues facing various park units. These projects address a myriad of resource management needs for aquatic or terrestrial plants and animals throughout the National Park Service. Thirty-nine projects were funded in FY 2003 at 35 parks (see *Appendix A*). Following are highlights for some of the fully funded projects:

- **Big Bend National Park** implemented a conservation agreement for two candidate plant species. In cooperation with the U.S. Fish and Wildlife Service, the Texas Department of Parks and Wildlife, and Texas State University, predictive habitat models were developed to help design conservation management plans to protect two candidate plant species. Accomplishments also included establishing permanent monitoring plots, analyzing 11 years of recruitment and mortality data, and preparing site protection and habitat improvement plans for Guadalupe fescue, one of the candidate species. A major finding of this project was that Guadalupe fescue seed banks are very short lived and soil surface treatments may be necessary to ensure recruitment. Persistence of this species in the last decade has depended on the survival of existing plants, which may be nearing the end of their life cycle. Therefore, planned habitat improvements are important to ensure the persistence of both rare species.
- **Saguaro National Park** developed information needed to design strategies for the management and recovery of lowland leopard frogs in the Rincon Mountain District of the park. The species currently persists in several small, isolated populations in the park, but basic information necessary for their successful conservation and management was lacking. The University of Arizona, through a cooperative agreement with the Sonoran Desert Cooperative Ecosystem Studies Unit, is conducting a parkwide survey, identifying specific threats and movement corridors, and developing a habitat model. Major findings thus far include discovery of this species in several previously undocumented locations and insight into habitat needs that will help guide management decisions.
- A digital database for tracking high-risk plant species was developed for a “Sensitive Plants and Orchid Recovery Plan” at **Indiana Dunes National Lakeshore**. In a part of the project that examined 21 state-listed and park-sensitive species in one unit of the park, 10 species populations were found to be stable, nine species populations have declined, and two species could not be located. However, four other species not reported in 1990 were present in FY 2003. In addition, habitat favorable for orchids was searched in the database. Seeds were collected from identified localities for propagation, but only one of four orchid species collected, *Cypripedium acule*, successfully germinated. Out-planting of *C. acule* plantlets is scheduled for the following spring. Successful hand-pollination of rare orchids at the park, combined with orchid pollinator investigations, suggest that the lack of a natural fruit set of these orchids may be related to the absence of pollinators.
- **Lake Mead National Recreation Area** developed a “Comprehensive Invasive Plant Management Plan,” which is undergoing its final compliance review. The plan provides the framework for a working philosophy that emphasizes prevention and early treatment of invasive plants. Sources of invasives are discussed in the plan, which outlines actions and methods to prevent invasive plant introductions and spread, as well as

Studies on rare orchids and their pollinators at Indiana Dunes National Lakeshore revealed a possible absence of pollinators in the park ecosystem. NPS PHOTO



to treat existing invasive plants. A large portion of the shoreline, developed areas, and primary vector areas of Lake Mead have been surveyed and mapped, and incipient populations of invasive plants have been treated. An aquatic plant survey has been started and will be ongoing. This plan guides the park for many years in the chronic battle against invasive plants.

GEOLOGIC RESOURCES PROGRAM

Challenge Activity:

- ***Protect geologic resources***
- ***FY 2003 Allocation: \$2,670,000***

The Natural Resource Challenge provided the first funding for geologic resource management activities other than mining and minerals-related activities in the Geologic Resources Division (GRD). Challenge funding supports six geoscience specialists in geologic program areas that provide expertise at the national level in cave resources and karst processes, coastal resources and processes, disturbed lands restoration, geologic hazards management, and paleontology. This specialized expertise is being used to support parks, regions, vital signs networks, and the Inventory and Monitoring Program.

This program contributed to the National Park Service far exceeding its FY 2003 goal to restore 95,820 square feet of cave floor, achieving 161,765 square feet of restoration in FY 2003. However, the National Park Service did not attain its goal of having 30 percent of known paleontological localities in good condition. This is because of an improved inventory of paleontological resources, which increased the total number of known localities (2,097 newly identified localities, resulting in a total of 5,149). Limited funding to assess fully the condition of these newly discovered localities resulted in a lower percentage (22 percent) of the total sites known to be in good condition.

The following are some FY 2003 program accomplishments:

- Partnering activities in the cave and karst program included coauthorship of a new book entitled "Recommendations and Guidelines for Managing Caves on Protected Lands" with the Karst Waters Institute, Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, and the National Cave and Karst Research Institute (NCKRI). This book may be translated into French for use in Europe.

- Advances in cooperative planning and environmental compliance were made on several coastal engineering projects proposed by the U.S. Army Corps of Engineers in and near parks. Examples include a major restoration effort at **Assateague Island National Seashore** to mitigate adverse impacts of the Ocean City jetties, and collaboration on the coastal shoreline protection project at **Fire Island National Seashore**.
- In the aftermath of Hurricane Isabel, GRD staff provided on-the-ground technical assistance and coordinated with other agencies and university geologists to provide coastal process scientific expertise to park managers facing difficult natural resource management decisions on an urgent daily basis. Post-hurricane response decision-making was greatly aided by the existence of detailed baseline geologic information provided through the Inventory and Monitoring Program and remote sensing data.
- Disturbed land restoration program and geo-hazard program staff provided oversight for 12 Natural Resource Preservation Program restoration projects in 11 parks. These projects restored nearly 150 acres of severely disturbed lands.
- Support was provided for fossil resource surveys at four parks. Some assistance involved partnering with university faculty and graduate students. Other support resulted in the significant discovery of an extinct rhinoceros fossil.

NATURAL RESOURCE PRESERVATION PROGRAM (NRPP)

Challenge Activity:

- *Expand NRPP project fund, specialized inventories, training, etc.*
- *FY 2003 Allocation: \$12,693,000*

Most ongoing resource management activities are undertaken and funded at the park level. National parks usually have little or no flexible, dedicated funding for cyclical and one-time project needs. Thus, to undertake larger projects, most parks require special funding. The major source of such funds is the Natural Resource Preservation Program (NRPP). This program provides the only reliable and dedicated source of

National Park Service funding for natural resource management projects costing more than \$50,000. Natural Resource Preservation Program funds are distributed among seven subcategories: larger natural resource management projects; special categories dedicated to threatened and endangered species and disturbed lands restoration; and regionally managed funding, including one specific to small parks. In addition, some funding is provided for U.S. Geological Survey biological technical assistance. A breakdown of funding by category is included in Chapter Five. Highlights of FY 2003 accomplishments in each of these categories follow. See Appendix B for a complete listing of projects funded under the Natural Resource Preservation Program.

In addition to contributing to the National Park Service's general resource protection goal, many of these projects directly contributed to the National Park Service exceeding its goals for containing exotic vegetation, restoring disturbed land, and achieving stable or improving populations of threatened and endangered species.

Natural Resource Management Projects

The largest segment of the Natural Resource Preservation Program funds a broad range of competitively selected, multi-year natural resource management projects that may cost as much as \$900,000 each. The total number of natural resource management projects funded through this program has significantly increased since FY 2000, with funding provided by the Natural Resource Challenge, from 49 projects in FY 2000 to 75 projects in FY 2003. The majority of projects funded fall within these categories: restoration, exotic species control, resource assessment and mapping, and natural resource management plan development. Nineteen projects received their last year of funding in FY 2003. Some highlights follow.

- A internal review draft feral hog management plan and associated draft environmental assessment were developed for **Congaree Swamp National Monument** by the South Carolina USGS/BRD/Cooperative Research Center Unit and Clemson University after they completed bimonthly monitoring of feral hog disturbance activity over three years at 12 monitoring plots. Data show

feral hog disturbance was relatively frequent and widespread for wetland habitats on the floodplain, and occasional in upland habitats adjacent to the floodplain. Disturbance was also relatively persistent in certain habitat types, such as seepage areas. The plan considered the information gathered during the monitoring study, the available literature, and discussions with several resource management experts.

- The biological and sociological effects were studied of the Teton Wolf Pack, a group of approximately 20 wolves utilizing **Grand Teton National Park**, and several educational efforts were undertaken to provide the public with information about the return of wolves to the Jackson Hole, Wyoming, area. Weekly monitoring efforts via aerial telemetry and ground surveys documented the pack's movements, including dispersal, reproduction status, number of pups, and wolf-livestock conflicts. A survey to evaluate public attitudes towards wolves and their management was produced and distributed to park visitors and local residents; analysis of the survey will be completed during winter 2003/2004.
- A coastal dune area was restored at Abbott's Lagoon at **Point Reyes National Seashore** by removing nonnative iceplant and European beachgrass from 30 acres of coastal dune habitat. This resulted in a 33 percent increase in native plant species, including two endangered plants, beach layia and Tidestrom's lupine, and improved habitat for the endangered myrtle silverspot butterfly. The restoration also resulted in the establishment of four nesting sites for western snowy plovers within the project area. The project provided the park with valuable information on removal methods of nonnative plants, improved conditions for four federally listed species, and helped to prioritize sites for future treatment.
- English ivy and other highly invasive, shade-tolerant exotic plants were hand-cleared from 101 acres of old-growth redwood forest at **Redwood National Park** by the California Conservation Corps (CCC) and the California

Department of Corrections. English ivy had formed thick mats on the forest floor, altering wildlife habitat and suppressing native plants. Ivy vines were growing up into the ancient trees, threatening to topple them if left unchecked. As the ivy grows into the sun, it is able to flower and produce seeds, which are then eaten by birds and distributed into uninvaded groves, enabling exponential reproduction. Additional support for this project came from California Department of Parks and Recreation and park operating funds.

Threatened and Endangered Species Projects

The long-term goal of this group of projects is to reverse the decline of listed species and to reestablish species that have been extirpated from parks. Despite the obvious importance of implementing identified recovery plan actions, limited funding has precluded many parks from implementing many needed actions. Therefore, this NRPP project funding emphasizes on-the-ground conservation actions. Larger threatened and endangered species projects are also funded within the Natural Resource Management portion of NRPP and are eligible for regionally administered NRPP funding. This allocation was established to assure that a minimum amount of funding would address this NPS goal. This funding directly contributed to the National Park Service exceeding its FY 2003 goal for 22.3 percent of park populations to remain stable and for 14.5 percent to be improving; parks reported that 23.3 percent of their threatened or endangered species were stable, and 29.9 percent were improving.

Fourteen projects were funded in FY 2003, including five that were fully funded, receiving their last year of funding, including the following:

- **Cape Hatteras, Cape Lookout, and Assateague Island National Seashores** assessed habitat to determine potential restoration sites for the federally threatened seabeach amaranth using Geographic Information System (GIS) and Light Detection and Ranging (LIDAR). In the past, some of the more substantial naturally occurring populations of seabeach amaranth, an East Coast native, were found in North Caro-

lina. The numbers have dropped dramatically in North Carolina and throughout much of the range of this species. Lab-reared juveniles and lab-germinated seedlings at Cape Hatteras were transplanted in three elevation ranges—below, within, and above the elevation range considered appropriate. Surveys after transplantation showed percentages of plants reaching seed-set in the three elevations were 0 percent, 67 percent, and 97 percent, respectively; this information will help resource managers to select sites for future plantings.

Disturbed Lands Restoration Projects

A portion of the NRPP was established in FY 2000 for projects related to disturbed land restoration, a reflection of the tie between the Natural Resource Challenge funding and the National Park Service Strategic Plan. Disturbed lands are those park lands where the natural conditions and processes have been impacted or altered by development (such as facilities, roads, mines, and dams) or by agricultural practices (such as cropping, grazing, and timber harvest). Restoration is the process of assisting the recovery of disturbed areas and reintegrating the site into the surrounding natural system using direct manipulations. This funding directly contributed to the National Park Service exceeding its goal to restore a cumulative 13,500 acres of disturbed land by the end of FY 2003 by 272 acres.

Twelve projects were funded in FY 2003, featuring four that received final funding, including the following:

- The Wondering Woods area at **Mammoth Cave National Park**, a 50-acre abandoned theme park, was restored. Site restoration initially entailed the demolition, removal, and disposal of dilapidated structures and remnants from previously dismantled buildings, gravel parking areas, fences, and trash dumps. Resulting surface cavities were filled with soil and contoured to conform to the surrounding landscape and drainage patterns. Exotic plants, such as Japanese honeysuckle and mimosa trees, were eradicated, and bare soils were covered with a biodegradable ground cover to stabilize the site and prevent erosion. Forty acres of the site were then seeded

with a native grass/forbs seed mix to restore the prairie/barren plant community. These efforts also improved the water quality of runoff from the site, which flows into a karst aquifer. This aquifer supports the endangered Kentucky cave shrimp and freshwater mussel habitat, and in turn supports seven species of endangered mussels.

Small Parks Projects

NRPP funds are provided to regions to allocate to small national parks for projects. Small parks are defined, for the purposes of this funding, as those parks that fall in the lower third of funding for all parks. Funds are allocated according to the natural resource management workload of these parks. Funded projects included a wide variety of management actions such as natural resource management and monitoring plans, exotic species control, restoration of native ecosystems, natural resources surveys, inventories, assessments and analyses, and fence repair for resource protection. Sixty-nine projects in at least 57 parks were funded in FY 2003. The cost of these projects ranged from \$1,700 to \$40,400.

- **National Park of American Samoa** began resuscitating a weed-infested rainforest on Mt. Alava Ridge. Many of the park lands are infested with alien plant species, such as *Paraserianthes falcataria*. A greenhouse was constructed by park staff and village volunteers on elementary school grounds. This greenhouse has already provided approximately 1,400 trees for restoration efforts in the park and more than 800 trees for education purposes and local village plantings. All greenhouse activities were facilitated directly by the small parks NRPP funds in this project, which paid for seasonal employees, volunteers, and materials to construct the greenhouse. Five acres dominated by alien plant species, most of which were cleared prior to the project, were replanted with native trees and maintained during 2001 to 2003. Most of the trees planted in the restoration plots were asi (*Syzygium inophylloides*) and afa (*Neonauclea forsteri*), the predominant trees in local forests. All species were planted adjacent to their collection site.

NPS staff inform a television crew about the creation of a native botanical garden by National Park of American Samoa and Le'atele Elementary School. Restoring weed-infested areas located on village lands at National Park of American Samoa included objectives such as establishing a greenhouse and propagating native tree species, removing nonnative plants, and developing and implementing an educational model. NPS PHOTO



Regional Block Allocation Projects

NRPP funds are provided to regions for national park projects as a part of regional natural resource programs. These funds are evenly distributed among the regions at \$200,000 per region per year. Qualified projects are those that improve natural resource knowledge and condition, including projects such as specialized inventories (those currently outside the scope of the Servicewide Inventory and Monitoring Program's 12 databases) and mitigation actions (i.e., exotic plant or exotic animal control). Eighty-one projects in 51 parks were funded in FY 2003. The cost of these projects ranged from \$1,500 to \$75,000. Funded projects included a variety of management actions such as ecosystem restoration, exotic species control, seismic hazard inventories, wildlife and vegetation inventories and assessments, soundscape monitoring, public outreach, and employee development.

Alaska Special Projects

This funding category was funded and established in FY 2003 to enable the NPS to undertake projects to better protect and manage Alaska's National Park Service units, which are managed under the Alaska National Interest Lands Conservation Act (ANILCA) and other Alaska-specific re-

quirements, including providing for subsistence harvests. During the first year of funding, some of the projects undertaken include the following:

- Studies with the University of Alaska and the U.S. Geological Survey to collect and evaluate baseline data about arctic animals such as musk ox, lynx, and snowshoe hare.
- Studies on marine birds in **Glacier Bay National Park and Preserve**, Steller sea lions and sockeye salmon in **Wrangell-Saint Elias National Park and Preserve**, and sockeye salmon in **Aniakchak National Monument and Preserve**.
- Social science research at the historic **Klondike Gold Rush National Historic Park** town site of Dyea to assist park managers to develop appropriate visitor and resource management strategies.
- Documentation of subsistence harvest levels and patterns for the Native Village of Buckland, working with the Alaska Department of Fish and Game.

Several of these studies continue, and new cooperative research is planned in FY 2004.

USGS Biological Technical Assistance Agreement–Park-Oriented Biological Support

The U.S. Geological Survey-Biological Resources Division and the National Park Service, through the Natural Resource Preservation Program, jointly support biological projects that provide exploratory research and technical assistance to national parks. Twenty-four separate projects were funded in FY 2003. Information on the project topics, as well as status reports on the projects, is included in Appendix B. Many FY 2003 projects address continuation of endeavors that were initiated in FY 2002 or in various phases of previous years.

Servicewide Projects

In addition to national parks, there are often project needs outside specific Servicewide programs which require funding unavailable from other sources. These special needs are often interdisciplinary, and may include activities with professional organizations, certain publications, or work on Servicewide databases. Specific project needs that cannot be accommodated operationally are identified for funding by NRPP or fee monies or other sources. In FY 2003, as in the past, several of these needs exist for database systems and information dissemination efforts not related to inventory and monitoring. Some FY 2003 projects were designed to provide tools or capacity that will benefit many programs and components of the National Park Service, such as the prototype information synthesis project and the Natural Resource Laureate Program. Other projects respond to special issues that are beyond the capacity of the base programs to fund, such as assessing

the vulnerability of coastal parks to climate change.

RESOURCE DAMAGE ASSESSMENT AND RECOVERY PROGRAM

Challenge Activity:

- *Implement Resource Protection Act to restore resources*
- *FY 2003 Allocation: \$1,276,000*

Under the Park System Resource Protection Act (PSRPA) (16 USC 19jj), the Oil Pollution Act (OPA) of 1990, the Clean Water Act as amended by OPA (CWA), and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the National Park Service conducts damage assessments and restoration for injuries to park resources in NPS units. Funding provided by the Natural Resource Challenge enhanced capabilities of the program. Accomplishments in FY 2003 include: (1) direct technical assistance to parks in conducting damage assessments for incidents injuring park resources and in planning and implementing restoration projects; (2) outreach and training on damage assessment for park staff; and (3) continued development of policies and procedures for the program. Some FY 2003 highlights include the following:

- **Vessel Groundings in Dry Tortugas National Park**—Cases are pending for vessel groundings in 2001 and 2002. The incidents, involving four vessels, are jurisdictionally complex, and resulted in injury to and loss of some of the most significant coral reef and submerged cultural resources in the National Park System.

Resource Damage Assessment and Recovery Program FY 2003 Program Activity by Region and Legislative Authority

AUTHORITY	HQ	ALASKA	INTER- MOUN-	MID- WEST	NAT'L CAPITAL	NORTH- EAST	PACIFIC WEST	SOUTH- EAST	TOTAL
Park System Resource Protection Protection Act	1	3	4	2	4	7	5	27	53
Oil Pollution Act	-	-	-	-	-	-	2	2	4
Comprehensive Environmental Response, Compensation, and Liability Act	1	-	1	3	-	5	2	1	13

- **Obed National Wild and Scenic River**—The U.S. Fish and Wildlife Service, the State of Tennessee, and the NPS have completed response actions to the July 2002 oil spill in the Obed River. Damage assessment and restoration planning are underway.

Program staff worked with 19 different park units in FY 2003 to plan support and implementation of 32 different restoration projects using funds collected and withdrawn from successful resource damage claims. The accompanying table summarizes by region and legislative authority program activity in FY 2003.

RESOURCE PROTECTION PROGRAM

Challenge Activity:

- *Establish Resource Protection Fund*
- *FY 2003 Allocation: \$298,000*

The Resource Protection Program supported four projects in its second year of funding that call for innovative approaches involving natural resource specialists, protection rangers, and partners from other agencies and universities. The new resource stewardship and protection curriculum, which was proposed by several regions, is now providing training across the National Park Service. A model to focus protection efforts toward those natural resources most at risk is being applied cooperatively by the parks along the Appalachian Mountains, utilizing the expertise of economists as well as botanists. Special Agent Ken Johnson of Shenandoah received a national award for pioneering this enforcement approach at the biome level. New surveillance techniques are being tested in Capitol Reef to protect endangered cacti that are advertised on Internet sites. Another example follows:

- **Illegal mushroom harvest at Mount Rainier National Park** was evaluated. Mushroom harvest is a popular activity in and around Mount Rainier National Park. Although personal harvest of mushrooms is allowed in the park, it is limited to one quart of fruiting bodies per person each day. Illegal commercial harvest has long been suspected. Consequently, the park developed potential habitat maps using GIS data based on the autecology and habitat requirements of desired species. During 2002 and 2003 the park surveyed potential mushroom

habitat near existing roads, documented potential illegal harvest and impacts from that harvest, conducted law enforcement patrols, and developed training materials. Local markets, including Pike Place Market in Seattle, were visited to determine desired species and sources. Permits from the U.S. Forest Service were reviewed, and interviews with local buyers were conducted. Citations or warnings were written in six cases for mushroom harvest greater than the one-quart limit. One citation was issued for collection of approximately 15 pounds of fruiting bodies. The species of mushrooms confiscated implied that this was likely a commercial collection.

While initially funds were sought by several parks to address pressing needs for routine patrols, proposals increasingly show the innovation and collaboration between divisions that this funding source requires. See Appendix C for a complete listing of projects funded under the Resource Protection Program.

WATER RESOURCES PROGRAM

Challenge Activities:

- *Monitor water quality in parks and assess watershed conditions*
- *Expand water resource protection and restoration*
- *FY 2003 Allocation: \$11,614,000*

The National Park Service Water Resources Division worked with national parks, regions, and Washington office personnel to continue implementation of the water resources component of the Natural Resource Challenge. A funding increase was received in FY 2003 to support three new aquatic resource professionals in the field. Funding was also received to support watershed condition assessments in parks and water quality monitoring in five additional Park Vital Signs Networks.

This was the fourth year of funding for a program that reflects a direct connection between the Natural Resource Challenge and the National Park Service Strategic Plan. The Natural Resource Challenge-related components of the Water Resources Program include both new capability to track the attainment of water quality standards in units of the National Park System and expanded efforts to improve aquatic

resources through projects and field-based aquatic resource specialists who can work with other water resource managers in watersheds requiring attention. The National Park Service goal for FY 2003 was that waters in 65 percent of parks were unimpaired, that is, not included on state lists of quality-impaired waters or otherwise documented by the park as having water quality problems or standards violations. The National Park Service did not attain this goal in FY 2003, as only 62 percent (178 of 288 applicable parks) had unimpaired waters. This represented a slight decrease over 2002 of parks with unimpaired waters, primarily because many parks have recently completed water quality inventories that have discovered quality-impaired water bodies that were not previously reported. For example, Badlands National Park recently discovered that a spring was contaminated with the pesticide atrazine. The information being provided by Natural Resource Challenge-funded efforts, combined with increased capacity to address aquatic resource issues, will enhance National Park Service ability to improve water resource conditions in parks in the future.

Water Resource Projects

Funding for this activity supports projects in three areas: Water Resource Protection Projects, Competitive Projects, and Other Projects, which are non-competitive. Projects in these areas include general water resources, water quality, wetlands protection, and water rights. Highlights of FY 2003 accomplishments in each of these project categories are included. For a complete listing of projects funded in FY 2003 under Water Resource Protection, see Appendix D of this report.

Water resource protection projects help to fund data collection and analyses that target development of scientific information that will benefit decision-makers, including federal managers, court judges, and state administrators. Results are often intended to support settlement negotiations conducted to avoid contested case hearings or contested land use decisions, or to support the implementation of settlements. Often hydrologic characterization is a need common to all water resources protection issues addressed by this budget. The majority of these FY 2003 project funds were used to

support ongoing studies designed to characterize surface or groundwater flow systems. In the western United States, ongoing projects are developing modeling information that will benefit the capabilities of decision-makers such as federal managers, judges, and administrators to predict effects of large-scale development in regional groundwater flow systems. In the eastern United States, hydrologic studies are developing information on the effects of impoundments on surface river systems. These tools are needed by decision-makers to understand the potential for impacts to park water resources in the future from a number of existing water development proposals. In addition, hydrologic data are often required to implement settlement agreements.

To increase the effectiveness of its water resource protection project funding, the National Park Service partners with other nonfederal entities. Some studies occur as a result of collaboration with state or private entities with common science objectives. For example, hydrologic data collected by NPS studies for Lake Mead National Recreation Area and Death Valley National Park are shared with the Nevada State Engineer, southern Nevada water purveyors, and private developers, thereby contributing to the larger-scale investigation of water availability in southern Nevada. In another example, data and other science information collected at Chickasaw National Recreation Area contribute to an ongoing state-federal study of the Arbuckle-Simpson Aquifer in southeastern Oklahoma.

Water Resources Division competitive projects support a wide range of park-based activities. Such efforts include riparian/stream, wetland and watershed restoration, and regulatory assessments. Projects also support design and implementation of best management practices required to improve water quality to meet state-mandated polluted runoff or non-point source pollution control, one-time assessments or inventories of water quality baseline conditions or contaminants, wetland inventories, groundwater assessment and monitoring, well and spring inventories, channel and bank stability investigations, floodplain assessments, water resources management planning, and other water resources-related activities.



Natural Resource Challenge funding enabled restoration of native vegetation to a savanna wetland at Moores Creek National Battlefield. By 1940 a drainage ditch installed in the early 1900s (top) had altered the hydrology and plant community of the historic pine-savanna wetland system(1). Pre-drainage water levels were restored when the drainage ditch in the savanna was plugged in 1998, but native bunchgrasses had failed to recolonize the site (2). A prescribed burn in fall of 2003 (3) set the stage for reintroducing native bunchgrasses using nursery-grown plugs (4). NPS PHOTOS

Two examples of the projects funded in FY 2003 follow:

- Native vegetation was restored to the savanna wetland at **Moores Creek National Battlefield**, restoring the terrace east of the bridge to the ecosystem in existence at the time of the Battle of Moores Creek Bridge in 1776. Ditching, mowing, seeding, fertilizing, and other activities during the 20th century had converted the site to a drained, weed-dominated meadow. In the late 1990s, the NPS began restoring the historic landscape by blocking the drainage works and recreating the original wetland hydrology, but wire grass (*Aristida stricta*) and other native bunchgrass species showed no sign of recolonizing the site. These grasses are critical to pine savannas, providing fuel for the fires that maintain these ecosystems and creating conditions that support rare plants such as the Venus flytrap. Using bunchgrass seeds from savannas on nearby Nature Conservancy lands, a nursery was contracted to grow, deliver, and supervise

the planting of 25,000 plants over a two-year period. A prescribed burn was completed as well. With favorable weather conditions, the plants introduced to the savanna in December 2003 should grow large enough during 2004 for a fall burn, to be followed by planting of the remaining plants by December 2004.

- The U.S. Geological Survey-Pennsylvania District developed a groundwater monitoring plan for **Delaware Water Gap National Recreation Area** that assesses current water quality conditions and establishes a baseline for comparing future changes within the area. A full report submitted to the park includes a description of the Delaware Water Gap NRA region and identifies possible threats to groundwater quality. The report also describes the geohydrologic framework of the region, thereby enabling park managers to make decisions regarding a groundwater monitoring network; provides a searchable database of existing research completed within and around

the region; compiles a monitoring-well inventory that verifies the suitability for inclusion in the network; and contains a proposal for objectives, approach, and estimated budget for future completion and implementation of a groundwater monitoring network within the recreation area.

Because of the limited professional fishery expertise within the National Park Service, a small amount of funding is directed at developing and increasing cooperative relationships between the academic community and the NPS fisheries program. Funds are set aside to help foster graduate student research at National Park System units and to help cooperatively fund fishery students engaged in NPS park projects. Potential high-priority projects suitable for graduate student research are identified through the NPS project need data system and matched to student availability through discussions with fishery professors. The program helps introduce top caliber fishery students to National Park Service programs and expands the level of expertise made available to parks. In FY 2003 a two-year project was completed in Rocky Mountain National Park on the evaluation of barriers to the upstream movement of nonnative brook char.

Water Quality Monitoring

Full program funding was allocated to 17 Park Vital Signs Networks in FY 2003, including five new networks (allocations are included in Chapter Five). The five newly funded networks include Southwest Alaska, Northeast Temperate, Southern Colorado Plateau, Pacific Island, and Great Lakes. Network planning approaches included personnel hiring, in-house allocation of staff, university cooperative agreements, and USGS Interagency Agreements. In addition, some equipment acquisitions were made. All networks accomplished the following activities: (1) network water quality planning workshops; (2) historic data compilations and analyses; (3) information input on state-listed impaired waters and park “outstanding” waters; (4) documentation of significant water quality stressors/threats; (5) synoptic inventory studies in support of detailed statistical design; and (6) database management and GIS support programs. See Appendix C for the allocation of

funding under Water Quality Park Vital Signs Monitoring.

Work proceeded during FY 2003 on development of program technical guidance, technical protocols, detailed study plan and Quality Control/Quality Assurance Plan guidance, and database management. Database templates are being developed for networks so that data can be managed consistently with the requirements of STORET, and also as part of Network Vital Signs Monitoring databases. The Servicewide NPS water quality database being constructed by the program has more than 2.5 million water quality observations. This database has served as the starting point for most network water quality data compilation and analysis efforts.

Water Resource Protection—Aquatic Resource Professionals

In FY 2003 the Natural Resource Challenge funded three additional aquatic resource specialists: a groundwater hydrologist at Chickasaw National Recreation Area, a marine ecologist at Fire Island National Seashore, and a groundwater hydrologist at Lake Mead National Recreation Area. This brings the number of new aquatic resource specialists funded by the Natural Resource Challenge to a total of 15 field positions (*see Appendix D*).

Before funding provided by the Natural Resource Challenge, only 20 parks had aquatic resource professionals on staff. The new field-based staff work on aquatic resource issues in a number of parks to provide technical assistance, identify and conduct technical investigations to determine the condition of park aquatic resources, determine if actions of the National Park Service or external parties impair or impact resources, assist in developing and implementing aquatic resource mitigation and restoration projects, and interpret and implement National Park Service water resource-related policies and regulations. While these 15 Challenge-created positions work on a wide range of water resource-related issues facing the parks, some particularly significant issues addressed in FY 2003 include the following:

- The aquatic ecologist for the Central and Northwest Alaska Network conducted a wetland plant inventory at **Wrangell-St.**

Elias National Park and Preserve; developed a water resources monitoring plan for **Yukon-Charley Rivers and Gates of the Arctic National Park**; conducted a pilot study to test the field sampling protocols for aquatic monitoring in the Central Alaska Network; and monitored a large NPS-USGS project to monitor groundwater quality at **Anaktuvuk Pass in Gates of the Arctic National Park and Preserve**.

- The groundwater hydrologist at the Sonoran Desert Network worked with USGS and park staff to conduct water quality sampling at **Tumacacori National Monument**; planned monitoring for Apache Spring in **Fort Bowie National Historic Site**; investigated options for potable water supply outside of **Saguaro National Park**; provided field support in the installation of monitoring instrumentation at Rincon Creek in Saguaro National Park; and measured water levels in springboxes and several wells at **Coronado National Memorial**.
- The aquatic ecologist at the Center for Urban Ecology in the National Capital Region provided comprehensive review of water quality monitoring efforts in **Morristown National Historic Park**, **Wolf Trap National Park for the Performing Arts**, **Catoctin Mountain Park**, and **Prince William Forest Park** that involved technical evaluations of the design of park-based water quality monitoring programs and statistical analysis and interpretation of long-term data sets.
- A cooperative interdisciplinary project with the Cooperative Ecosystem Studies Units (CESU) system initiated in 2003 to conduct a review, evaluation, and classification of condition assessment methods, and to develop a compendium of methods applicable to NPS needs, as well as guidance in methods selection. The field of watershed condition assessment is new, and there are no standard or widely accepted methods or approaches to conducting structured, replicable assessments of watershed resources.
- Six multi-year partnership projects at **Lake Roosevelt National Recreation Area**, **Rock Creek Park**, **Niobrara National Scenic Riverway**, **Mammoth Cave National Park**, **Yosemite National Park**, and **Canyonlands National Park** as part of the NPS-USGS Water Quality Assessment and Monitoring Partnership Program.
- A hydrologic assessment at **Congaree Swamp National Monument** conducted in response to an emergency draining and repair of an upstream dam.

Water Resource Technical Assistance

This was the fundamental component of the Water Resources Program before the Natural Resource Challenge, and it has not been expanded with Challenge funding. Through this effort, the Water Resources Program provides direct assistance to parks on high-priority needs using a combination of its own staff and expertise acquired through cooperative agreements. Examples of accomplishments include the following:

- Completed Water Resources Management Plans for **Sleeping Bear Dunes National Lakeshore**, **Richmond National Battlefield Park**, **Hagerman Fossil Beds National Monument**, and **New River Gorge National River/Gauley River National Recreation Area/Bluestone National Scenic River**.
- Developed technical portions of Fisheries Management Plans for **Amistad National Recreation Area**, **Biscayne National Park**, and **North Cascades National Park**.

Watershed Condition Assessment Program

Funding provided for this effort was used for initial design work on a long-term program of systematic park-based assessments of watershed conditions, for shorter-term condition assessments, and to support the backlog of watershed and water quality assessment needs currently identified in the project needs system. As a result of the latter, a larger number of competitive projects were funded, discussed in the previous section and listed in Appendix D.

Examples of other work supported in short-term condition assessments and planning for longer-term assessments include the following:



A Student Conservation Association volunteer uses a kicknet to collect stream organisms at George Washington Memorial Parkway. In addition to providing baseline water quality data, the surface water quality monitoring program provides valuable resource management experience for SCA conservation interns. NSP PHOTO

- Evaluated alternative discharge locations for the Las Vegas sewage treatment plant at Lake Mead.
- Provided technical guidance to Yosemite Valley planning and Merced River restoration.
- Provided technical support to development of a sediment management program for Elwha River dam removal.
- Evaluated alternatives for management of a uranium tailings pile at Moab, Utah.
- Evaluated flood mitigation alternatives at Manzanar National Historic Site.
- Assisted in the development of a flood warning system at Haleakala National Park.
- Participated in the development of the Colorado River Annual Operating Plan.
- Assisted the Department of the Interior in securing a settlement agreement that sets a course to secure water rights for the **Black Canyon of the Gunnison National Park** in Colorado.
- Secured final Snake River basin adjudication decree for water rights at **City of Rocks National Preserve** in Idaho.
- Collaborated with other Interior and nonfederal interests to advance the level of scientific information available to decision-makers for groundwater systems in southern Nevada to protect resources at **Lake Mead National Recreation Area** and **Death Valley National Park**.
- Assisted **Saguaro National Park** to initiate efforts to secure protection for instream flows in Rincon Creek under Arizona law.



Tree characteristics are measured and GPS location data are gathered by an NPS seasonal ranger and high school summer interns from the Casey Tree Foundation in Washington, D.C. Such work on the National Mall is part of a program conducted by the National Capital Parks Urban Ecology Research Learning Alliance. NPS PHOTO